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MODELING THE DYNAMIC RESPONSE OF A CARBON-FIBER-REINFORCED PLATE AT RESONANT VIBRATIONS CONSIDERING THE INTERNAL FRICTION IN THE MATERIAL AND THE EXTERNAL AERODYNAMIC DAMPING

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The frequency dependence for the dynamic elastic modulus of a Porcher 3692 CFRP at frequencies to 112.5 Hz is obtained from an experimental study on damped flexural vibrations of vertical cantilevered test specimens. A finite-element technique is developed for modeling the dynamic response of a long cantilevered carbon-fiber-plastic plate at resonant flexural vibrations according to the first vibration mode with account of internal damping, aerodynamic drag forces, and the frequency-dependent dynamic elastic modulus of the material. The damping properties of the plate are determined by the logarithmic decrement, which depends on the vibration amplitude of its free edge. Numerical experiments were carried out, which confirmed the accuracy of the technique. It is shown that the logarithmic decrement of the plate in the range of medium and high vibration amplitudes depends mainly on the aerodynamic drag forces.

Introduction

One of the most dangerous modes of dynamic deformation of a structure is the resonant one, which arises in it if the frequency of its natural vibration coincides with the frequency of an external cyclic action. As is known, at such a loading mode, the peak values of parameters of the dynamic stress-strain state grow manifold. Their correct and reliable

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